

What is claimed is:

1. An automatic rivet loading module comprising: a pusher mechanism; a gripper mechanism; a mandrel receptacle; and mechanisms for moving mandrels in the mandrel receptacle, said gripper mechanism configured to receive a rivet, at least one
5 of said mechanisms for moving mandrels in the mandrel receptacle configured to move a mandrel in the mandrel receptacle through the rivet such that the rivet threads onto the mandrel, said pusher mechanism configured to push a mandrel down in the mandrel receptacle, said gripper mechanism configured to move out of the way while the pusher mechanism pushes the mandrel down, at least one of said mechanisms for
10 moving mandrels in the mandrel receptacle configured to urge a mandrel out the mandrel receptacle.

2. An automatic rivet loading module as recited in claim 1, said pusher mechanism being retractable, said gripper mechanism being closeable when said
15 pusher mechanism is retracted, wherein when said gripper mechanism is closed, said gripper mechanism is ready to receive another rivet.

3. An automatic rivet loading module as recited in claim 1, wherein said mandrel receptacle is rotatable.

4. An automatic rivet loading module as recited in claim 1, said gripper mechanism comprising a plurality of gripper components.

5. An automatic rivet loading module as recited in claim 1, said gripper mechanism comprising a pair of pivotable gripper components.

6. An automatic rivet loading module as recited in claim 5, further comprising a gripper actuating mechanism operably associated with the gripper components and configured to facilitate pivoting of the gripper components relative to each other.

7. An automatic rivet loading module as recited in claim 5, wherein each of said gripper components comprises a rectangular block.

8. An automatic rivet loading module as recited in claim 5, wherein each gripper component includes a cut out such that, when the gripper components are pivoted together, the cut outs provide a receptacle which is shaped to receive a rivet.

9. An automatic rivet loading module as recited in claim 5, wherein each gripper component includes a cut out such that, when the gripper components are pivoted together, the cut outs provide a receptacle which is T-shaped on one side of the gripper components and is U-shaped on another side of the gripper components.

10. An automatic rivet loading module as recited in claim 5, wherein each gripper component includes an inclined surface such that when the gripper components are pivoted together, the incline surfaces define a lead cone area which is configured to lead a mandrel into a space provided between the gripper components.

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11. An automatic rivet loading module as recited in claim 1, said pusher mechanism comprising a pusher and a pusher actuating mechanism which is operably associated with the pusher, wherein the pusher actuating mechanism is configured to translate the pusher back and forth along a longitudinal axis of the pusher.

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12. An automatic rivet loading module as recited in claim 11, wherein an end of the pusher provides a recess for receiving an end of a mandrel.

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13. An automatic rivet loading module as recited in claim 1, wherein the mandrel receptacle includes a plurality of longitudinal chambers, each of said chambers being configured to receive and retain a mandrel, each chamber extending from a hole at a top of the mandrel receptacle to a hole at a bottom of the mandrel receptacle.

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14. An automatic rivet loading module as recited in claim 11, further comprising rivet retaining structure in each chamber, wherein the rivet retaining structure is configured to prevent travel of rivets therepast, along a mandrel.

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15. An automatic rivet loading module as recited in claim 12, wherein the rivet retaining structure comprises spring blades.

16. An automatic rivet loading module as recited in claim 11, wherein the mandrel receptacle includes a first side and a second side, a slotted portion and a closed portion being provided along each of said first and second sides.

17. An automatic rivet loading module as recited in claim 12, wherein each slotted portion extends from a bottom of the mandrel receptacle to the closed portion, and each closed portion extends from the slotted portion to the top of the mandrel receptacle, wherein each slotted portion provides that an opening extends from the side of the mandrel receptacle into at least one of the chambers.

18. An automatic rivet loading module as recited in claim 1, at least one of said mechanisms for moving mandrels in the mandrel receptacle comprising a stitch cylinder which is configured to enter and translate in the mandrel receptacle, and a stitch cylinder drive mechanism which is selectively controllable to move the stitch cylinder.

19. An automatic rivet loading module as recited in claim 1, at least one of said mechanisms for moving mandrels in the mandrel receptacle comprising a bullet-shaped member which is configured to enter and translate in the mandrel receptacle, a blade which extends from the bullet-shaped member, and a bullet drive mechanism, said blade connected to said bullet drive mechanism, said bullet drive mechanism selectively controllable to move the bullet-shaped member.

20. An automatic rivet loading module as recited in claim 1, wherein the mandrel receptacle is rotatable and is positioned on, and in, a cup.

21. A method of using an automatic rivet loading module to load rivets on a mandrel, said method comprising: closing a gripper mechanism of the module; providing a rivet to the gripper mechanism; positioning a first chamber of a mandrel receptacle of the module proximate the gripper mechanism, said first chamber having a mandrel disposed therein, using a pusher mechanism of the module to push the mandrel through the rivet in the gripper mechanism; opening the gripper mechanism; using a pusher mechanism of the module to push the mandrel down in the first chamber; moving the mandrel receptacle such that the first chamber becomes positioned proximate a mechanism for urging the mandrel out the mandrel receptacle; and using the mechanism to urge the mandrel out the mandrel receptacle.

22. A method of loading rivets on a mandrel as recited in claim 21, wherein the step of moving the mandrel receptacle such that the first chamber becomes positioned proximate said mechanism for urging the mandrel out the mandrel receptacle further comprises moving the mandrel receptacle such that a second chamber becomes positioned proximate said gripper mechanism, said second chamber having a mandrel disposed therein.

23. A method of loading rivets on a mandrel as recited in claim 21, said step of opening the gripper mechanism comprises pivoting a pair of gripper components relative to each other.

24. A method of loading rivets on a mandrel as recited in claim 21, said step of moving the mandrel receptacle comprising rotating said mandrel receptacle.

25. A method of loading rivets on a mandrel as recited in claim 21, said step of moving the mandrel receptacle comprising rotating said mandrel receptacle in a cup.

26. A method of loading rivets on a mandrel as recited in claim 21, further comprising using spring blades to prevent rivets from moving too far along a mandrel in the mandrel receptacle.

27. A method of loading rivets on a mandrel as recited in claim 21, further comprising using a stitch cylinder to move the mandrel through the rivet.

28. A method of loading rivets on a mandrel as recited in claim 21, further
5 comprising using a bullet-shaped member to urge the mandrel out the mandrel
receptacle.